Faculty Research Areas

Anuradha M. Agarwal
Work centers on the mid-IR (MIR) regime. Although previous silicon microphotonic devices predominantly utilized the NIR range, the MIR regime is extremely interesting for hyperspectral imaging and chem-bio sensing because most chemical and biological toxins have their fingerprints in this range. Work on MIR materials and devices is creating a planar, integrated, Si-CMOS-compatible microphotonics platform to enable on-chip imaging and sensing applications.
Rm. 13-4126
617-253-5302
anu @ mit . edu

Akintunde Ibitayo Akinwande
Micro- and Nano- structures for Sensors & Actuators and Vacuum Microelectronics. Devices for Large Area electronics and flat panel displays.
Rm. 39-553
617-258-7974
akinwand @ mtl . mit . edu

Polina O. Anikeeva
Neuroprosthetic materials and devices: chemistry, device physics, fabrication and testing in biological systems. Minimally invasive neural stimulation.
Rm. 8-425
617-253-3301
anikeeva @ mit . edu

Dimitri A. Antoniadis
Research is in the field of nanoscale solid-state electronic devices and the application of new materials systems and new structures to transistors for deeply scaled electronics.
Rm. 39-427a
617-253-4693
daa @ mtl . mit . edu

Karl K. Berggren
Superconductive nanodevice physics and applications. Nanofabrication methods, processes, and tool-development for application to quantum computing, electron and photon emission, and single-photon detection.
Rm. 36-219
617-324-0272
berggren @ mit . edu

Duane S. Boning
Design for manufacturability (DFM) of processes, devices, and integrated circuits. Characterization and modeling of variation in semiconductor and MEMS manufacturing, with emphasis on chemical-mechanical polishing (CMP), electroplating, plasma etch, and embossing processes. Statistical modeling of spatial and operating variation in advanced devices and circuits.
Rm. 39-415
617-253-0931
boning @ mtl . mit . edu

Vladimir Bulović
Physical properties of organic and organic/inorganic nanocrystal composite thin films and structures, and development of nanostructured electronic and optoelectronic devices. Applications of nanostructured materials in large-scale technologies.
Rm. 13-3138
617-253-7012
bulovic @ mit . edu

Anantha P. Chandrakasan
Design of digital integrated circuits and systems. Energy efficient implementation of signal processing, communication and medical systems. Circuit design with emerging technologies.
Rm. 38-107
617-258-7619
anantha @ mtl . mit . edu

Gang Chen
Micro- and nanoscale heat transfer and energy conversion with applications in thermoelectrics, photovoltaics, solar-thermal energy to electrical energy conversion, and microelectronics; nano-mechanical devices and micro-electro-mechanical systems; radiation and electromagnetic metamaterials; nanoengineered high thermal conductivity polymers and liquids; and desalination.
Rm. 3-260
617-253-0006
gchen2 @ mit . edu

Luca Daniel
Development of numerical techniques: uncertainty quantification and stochastic integral equation solvers for high dimensional parameter spaces. Parameterized model order reduction for linear and nonlinear dynamical systems. Applications include: nanodevices (CMOS MEMS resonators, silicon photonic devices, analog RF circuits and passives), the human cardiovascular circulatory system, and high resolution parallel transmission Magnetic Resonance Imaging (MRI) systems.
Rm. 36-849
617-253-2631
luca @ mit . edu

Jesús A. del Alamo
Nanometer-scale compound semiconductor transistor technologies for logic, RF, microwave and millimeter wave and power switching applications. Reliability of compound semiconductor transistors. Technology and pedagogy of online laboratories for engineering education.
Rm. 39-567A
617-253-4764
alamo @ mit . edu

Dirk R. Englund
Development of scalable semiconductor quantum information processing devices and systems, quantum enhanced sensors, and nanophotonic and electro-optic devices.
Rm. 36-591
617-324-7014
englund @ mit . edu

Nicholas X. Fang
Nanophotonic and acoustic materials and devices. Physics, nanofabrication, instrumentation.
Rm. 3-435B
617-253-2247
nicfang @ mit . edu

Clifton G. Fonstad, Jr.
Compound semiconductor heterostructure devices and physics. Optoelectronics: laser diodes, photodiodes, quantum effect devices, and optoelectronic integrated circuits. Monolithic heterogeneous integration on Si-CMOS. Multi-waveguide probe arrays for optogenetic brain studies. μ-scale thermophotovoltaics.
Rm. 13-3050
617-253-4634
fonstad @ mit . edu

Silvija Gradečak
Nanophotonics and electronics based on the synthesis, characterization and integration of low-dimensional systems.
Rm. 13-5094
617-253-9896
gradecak @ mit . edu

Jongyoon Han
Nanofluidic / Microfluidic technologies for advanced biomolecule analysis and sample preparation: cell and molecular sorting, novel nanofluidic phenomena, biomolecule separation and pre-concentration, seawater desalination and water purification, neurotechnology.
Rm. 36-841
617-253-2290
jyhan @ mit . edu

Judy L. Hoyt
Semiconductor devices. Fabrication and device physics of silicon-based heterostructures and nanostructures. High mobility Si and Ge-channel MOSFETs, nanowire FETs, novel transistor structures, silicon based photovoltaics, and silicon-germanium photodetectors for electronic/photonic integrated circuits.
Rm. 39-427A
617-452-2873
jlhoyt @ mtl . mit . edu

Pablo Jarillo-Herrero
Quantum electronic transport and optoelectronics with low dimensional materials, such as graphene, transition metal dichalcogenides, and topological insulators. Nanofabrication of van der Waals heterostructures. Mesoscopic physics and superconductivity.
Rm. 13-2017
617-253-3653
pjarillo @ mit . edu

Sang-Gook Kim
Energy harvesting, nano-enabled solar photon capture devices, PMUT, MEMS by ink jet printing, carbon nanotube assembly.
Rm. 1-306
617-452-2472
sangkim @ mit . edu

Lionel C. Kimerling
Silicon microphotonics, integrated sensing-on-silicon platform, silicon and tandem solar cells, glass-on-silicon platform, defects in photonic materials.
Rm. 13-4118
617-253-5383
lckim @ mit . edu

Mathias Kolle
Biological and bio-inspired photonic materials; Mechano-responsive tunable photonic fibers; Morphogenesis of biological photonic architectures; Marine optics; Nanofabrication techniques for soft, tunable micro-optical components; Bio-sensing using responsive photonic materials; Bio-manufacture of photonic components.
Rm. 3-162
617-324-7639
mkolle @ mit . edu

Jing Kong
Synthesis, characterization and applications of carbon-based nanomaterials (nanotubes and graphene) and inorganic nanowires.
Rm. 13-3065
617-324-4068
jingkong @ mit . edu

Jeffrey H. Lang
Analysis, design and control of electromechanical systems with application to micro/nano-scale (MEMS/NEMS) actuators, sensors and energy converters, traditional electromagnetic actuators, and flexible structures.
Rm. 10-176
617-253-4687
lang @ mit . edu

Hae-Seung Lee
Analog and mixed-signal integrated circuits with a particular emphasis in data conversion circuits in scaled CMOS.
Rm. 39-521
617-253-5174
hslee @ mtl . mit . edu

Scott Manalis
Micro- and nanoscale devices for biomolecular and single cell analysis.
Rm. 76-261
617-253-5039
scottm @ media . mit . edu

Ichiro Masaki
VLSI architecture. Emphasis on interrelationship among applications, systems, algorithms, and chip architectures. Major application fields include intelligent transportation systems, video, and multimedia.
Rm. 38-107
617-253-8532
masaki @ mit . edu

Jurgen Michel
Silicon photonics for optical interconnects. Ge epitaxy for detectors, modulator, and lasers. Novel optical designs for concentrator solar cells. High performance, Si based, parallel junction photovoltaic cells with thermal management. Octave spanning optical frequency comb generation.
Rm. 13-4110
617-253-7091
jmichel @ mit . edu

Tomás Palacios
Design, fabrication and characterization of novel electronic devices in wide bandgap semiconductors and two dimensional materials. Polarization and bandgap engineering. Transistors for sub-mm wave power and digital applications. New ideas for power conversion and generation. Interaction of biological systems with semiconductor materials and devices. Large area electronics based on nanowires and two dimensional materials.
Rm. 39-567B
617-324-2395
tpalacios @ mit . edu

David J. Perreault
Power electronics and energy conversion, electronic circuit design, control. Applications to industrial, commercial, scientific, transportation, biomedical, communications and energy systems.
Rm. 10-039
617-258-6038
djperrea @ mit . edu

Rajeev J. Ram
Development of novel photonics & electronics for communications, energy, and sensing.
Rm. 36-491
617-253-4182
rajeev @ mit . edu

Martin A. Schmidt
Micro- and nanofabrication of sensors, actuators and electronic devices, microelectromechanical systems (MEMS), design of micromechanical sensors and actuators, and micro/nanofabrication technology.
Rm. 3-208
617-253-7817
maschmid @ mit . edu

Charles G. Sodini
Electronics and integrated circuit design and technology. Technology intensive integrated circuit and systems design, with application toward medical electronic devices for personal monitoring of clinically relevant physiological signals.
Rm. 39-527B
617-253-4938
sodini @ mtl . mit . edu

Vivienne Sze
Joint design of algorithms, architectures, VLSI and systems for energy-efficient implementations. Applications include video coding/processing, computer vision, multimodal imaging, machine learning, health monitoring and distributed sensing.
Rm. 36-260
617-253-4752
sze @ mit . edu

Carl V. Thompson
Processing and property optimization of thin films and nanostructures for applications in electronic, micro-electromechanical, and electromechanical devices and systems. Interconnect and device reliability.
Rm. 13-5069
617-253-7652
cthomp @ mit . edu

Harry L. Tuller
Energy related materials, solid oxide fuel cells, solar assisted water splitting, resonant and chemoresistive sensors, solid state ionics, thin film transistors, MEMS structures and devices.
Rm. 13-3126
617-253-6890
tuller @ mit . edu

Kripa K. Varanasi
Interfacial engineering, thermal-fluids, and materials & manufacturing. Design and manufacturing of nanoengineered surfaces and their applications to energy, water, oil & gas, agriculture, transportation, electronics cooling systems for significant efficiency enhancements. Interfacial phenomena and engineering, fluid-surface & thermal-fluid-surface interactions, nanoengineered surfaces, interfaces & coatings, thermal fluids & heat transfer, phase change phenomena, micro/nanoscale two phase transport, separation, inverse materials design, thin films, nanoceramics and metals, superhydrophobic/philic surfaces, icephobic surfaces, nanomanufacturing, energy efficiency, flow assurance in oil & gas, water.
Rm. 35-209
617-324-5608
varanasi @ mit . edu

Luis F. Velásquez-García
Micro- and nano-enabled multiplexed scaled-down systems for space, energy, healthcare, manufacturing, and analytical applications. Carbon nanotubes, silicon carbide; electrospray, electrospinning, field emission, field-enabled ionization, plasmas, X-rays; electrical and chemical nanosatellite propulsion, plasma sensors, portable mass spectrometry, high-voltage 3D MEMS packaging, X-ray sources, tactile displays and sensors, ultracapacitors.
Rm. 39-657
617-253-0730
lfvelasq @ mit . edu

Joel Voldman
Microtechnology for basic cell biology, applied cell biology, and human health; Microsystems for stem cell biology.
Rm. 36-824
617-253-2094
voldman @ mit . edu

Evelyn N. Wang
Heat and mass transport at the micro- and nano-scales, nanoengineered surfaces, and thermal microdevices for applications in thermal management, solar thermal energy conversion, and water desalination.
Rm. 3-461B
617-324-3311
enwang @ mit . edu

Dana Weinstein
Micro electro-mechanical systems (MEMS), electromechanical transducers, phononic crystals for resonators and signal processing, MEMS sensors. Radio frequency resonators and oscillators for wireless communication and clocking. Fabrication of MEMS.
Rm. 38-246
617-253-8930
dana @ mtl . mit . edu